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techniques provide a good example close to home.

The question may be raised why, if technological change is embodied in new entrants to the labor force, do we usually find that older workers earn more than do new entrants with the same number of years of schooling? The answer is, of course, that employers place a value on the experience and the maturity of the older worker which more than offsets the value of the labor-embodied technological change. If one could compare two workers of equal experience and maturity, one with the education of twenty years ago and the other with the current model, there is little doubt that the latter would command higher earnings. This is particularly evident in fields experiencing rapid technological change, such as engineering, where recent graduates often earn as much as old-timers do despite the maturity and experience of the latter.

The concept of labor embodiment is likely to be most relevant when formal schooling and job security are important, as in the professional and technical occupations. Three-fourths of all professional and technical workers are employed in the service sector.

CHANGES IN DEMAND AND PRODUCTIVITY

Another area where the growth of services may require some refinement of concepts is in the analysis of the relation between changes in demand and changes in productivity. In many service industries it is not enough to know by *how much* demand has changed in order to predict the effect on productivity. At least two other dimensions of demand in addition to quantity must be specified.

One source of variation arises because output is frequently uneven, with peaks coming at particular hours of the day, particular days of the week, and even

particular weeks of the month. Such fluctuations are important for retailing, banking, barber and beauty shops, places of amusement, and some local government services. During non-peak times there is usually idle capacity. An increase in demand, if it occurs at these times, may result in very substantial gains in productivity. On the other hand, an increase in demand, if it occurs at times of peak demand, will probably not result in any increase in productivity.

A second source of variation is the "size of transaction."³⁰ This refers to the volume of business done with a single customer at a single purchase. My colleagues David Schwartzman and Jean Wilburn have found examples of service industries where increased demand, which takes the form of increases in the average size of transaction, results in greater increases in measured productivity than does an equivalent increase in demand that takes the form of more transactions.³¹ George Benston has reported a similar finding for banking, and I suspect that this is true of many service industries.³²

THE "REAL" GROSS NATIONAL PRODUCT

My final example of how the growth of services may affect economic analysis concerns the gross national product in constant dollars. This statistic is the key-

³⁰ Armen Alchian has a general theoretical discussion of this concept in "Costs and Output," in *The Allocation of Economic Resources, Essays in Honor of Bernard Francis Haley* (Stanford, Calif.: Stanford University Press, 1959), but he does not apply it specifically to the service industries. See also Jack Hirschleifer, "The Firm's Cost Function: A Successful Reconstruction," *Journal of Business*, July, 1962.

³¹ There is some question whether the former should be called increased output or not. Under present conventions for measuring output in many service industries, it is recorded as such.

³² "The Cost of Bank Operations" (unpublished Ph.D. dissertation, University of Chicago, 1964).

stone of many studies of productivity and economic growth. Unfortunately, it is probably becoming increasingly less useful for such purposes. The reason is very simple. Measures of real output in the service sector have always been unsatisfactory; as this sector becomes more important, the aggregate measure must become less satisfactory in the absence of significant improvements in the measures for individual industries.

Another trend working in the same direction is the decrease in market labor as a fraction of all time spent in productive activity. A small increase in the fraction of the adult population in the labor force has been more than offset by decreases in average hours per week and increases in vacations and holidays. Some of the increased free time may be spent in pure leisure, but probably the bulk of it is spent in the nonmarket production of goods and services and in consumer participation in the market production of services. As I have already suggested, how well or poorly these activities are carried out will surely influence economic well-being. Furthermore, both the output and inputs involved should be included in any comprehensive measure of productivity.

Economists have long been aware that the value of real GNP as a measure of output and economic well-being differs depending upon the level of economic development. There has been a presumption that the measure becomes more useful the more highly developed the economy.³³

Up to a point it is probably true that the higher the real GNP is, the more

reliable it is as a measure of economic welfare. But the trend may now be in the other direction, because at high levels of GNP per capita a large fraction of productive effort is devoted to services (where real output is very difficult to measure) and to other activities that are not measured at all.

An increase in home production at the expense of labor in the market reduces measured output because the former is mostly not included in the gross national product. If the outputs and inputs of home production were included, growth of this type of activity would probably tend to reduce measured productivity because of the absence of specialization and economies of scale. On the other hand, true economic welfare might be increased by such a shift if, as seems likely, labor in the market involves more disutility or less utility than labor in home production.

One example of the difficulty of measuring productivity and economic welfare at high levels of GNP per capita can be found in mortality statistics. At low or moderate levels of economic development, there is usually a negative correlation between real GNP per capita and death rates. However, now we have a situation where the United States GNP per capita is 50 per cent above the Swedish level, but life expectancy is considerably lower in the United States and the death rate for males 50–54 is double the Swedish rate. The reasons for this huge difference are not known, but are probably related to the pace of work, diet, exercise, as well as the output of the health industry.

I conclude that even as we increase our efforts to measure real output in the service sector, we must recognize that these efforts are likely to leave considerable margins of uncertainty. Future

³³ Simon Kuznets: "The importance of domestic activities relative to those that are part of the business system declines in the long run" (*National Income and Its Composition, 1919–1938* [New York: NBER, 1941]), p. 432.

studies of growth and productivity will probably find it necessary to develop auxiliary measures of "output" and economic welfare to be used in conjunction with the gross national product.

SUMMARY

The purpose of this paper is to report some tentative conclusions concerning the growth of the service industries and to indicate some implications of this growth for the economy and for economic analysis.

Between 1929 and 1963 employment in the service sector grew 1.7 per cent per annum faster than in the goods sector. At some point during the past decade the United States became the first "service economy" in the history of the world, that is, the first economy in which more than half of the employed population is not involved in the production of tangible goods. The more rapid growth of services was observed for individual industries as well as the sector aggregates and for occupations as well as industries. This shift represents an acceleration of a trend that has persisted for at least the past century.

Numerous conceptual and statistical problems in the measurement of real output make it difficult to explain precisely why service industry employment has grown so rapidly. The data examined in this paper appear to reject the hypothesis that the growth of real income per capita was a major explanation. The demand for services, compared with goods, may have been slightly more elastic with respect to income (principally because of the low elasticity for agriculture), but this was not an important reason for the shift of employment. Sector differences in the rate of growth of real output were probably very small; differences in the

rate of growth of real output per man were probably very large.

The differential in the rate of growth of real output per man reflects a moderate differential change in productivity, in the sense of efficiency in the use of resources, but this is not the only or major explanation. It also reflects a more rapid decline in hours per man in services, a more rapid rise in the quality of labor in goods industries, and a more rapid rise in capital per worker in the goods sector.

The shift of employment to services has many important implications. The trends discussed here may be offset by other changes that are also taking place in the economy, but they serve to indicate the likely effects of the relative growth of services, other things remaining the same. These trends include:

1. Growing employment opportunities for women and older workers.
2. Growing opportunities for part-time employment and urban self-employment.
3. Growing need for workers with more formal education.
4. Possible decreasing importance of unions and growing importance of professional organizations.
5. Possible trend toward greater personalization of work.
6. Growing importance of small firms.
7. Growing importance of nonprofit organizations (public and private).
8. Declining relative importance of physical capital.
9. Growing stability in employment and, to a lesser extent, in output.
10. Possible increase in cyclical variability in output per man-hour.

In addition to having important implications for the economy, the growing relative importance of the services appears to have implications for economic analysis as well. One problem arises because the consumer frequently plays an